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ENTOMOLOGY AND FORESTRY IN THE NORTHWESTERN UNITED STATES

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Sustained-yield forest management is an objective sought by private and public land-managing agencies as affording an assurance of permanency for lumbering communities. To reach this ideal policy of forest management certain fundamental requirements, such as a suitable acreage, stabilized ownership, assured reproduction of cut-over lands, regulation of annual cut, and above all, an adequate program of protection, must be recognized. To the laity the problem of forest protection is usually one of fire suppression. Though unfortunate, such a reaction arises naturally from the spectacular character of forest fires and the publicity given to them. However, timber-managing agencies realize that a complete program of forest protection must give full consideration to insects and disease, as well as fire.

Entomology is a factor in the successful management of forest lands. All stages in the development of trees, from seeds to mature plants, are liable to insect attack. Mature trees are more susceptible to attacks of insects, and in such timber stands there is always a normal loss as a result of bark-beetle activity. Though such losses are often offset and sometimes exceeded by growth, which gives a balanced condition with no material changes in timber volumes, this does not always provide for the maximum production per unit of forest land. However, epidemics of destructive insects which occur from time to time often leave large timbered areas in such a devastated

condition that the residual stand is not of sufficient value to warrant harvesting. Under such conditions many decades are required to replace a merchantable stand of timber.

Bark beetles can properly be considered as the most destructive forest insect enemies in the northwestern United States. It has been conservatively estimated that in Oregon and Washington during the years 1931 to 1935 inclusive the western pine beetle (Dendroctonus brevicomis Lec.) destroyed 4,507,000 M.B.F. of ponderosa pine. This destruction, which represents 6 percent of the total volume of ponderosa pine within these two states, is 97 percent of the amount cut for lumber and many times more than the loss by fire during the years mentioned. In Idaho and Montana the loss of ponderosa pine for this half decade amounted to 789,875 M.B.F., or 3 percent of the total volume, which is 85 percent of the lumber cut for that period. During these years the estimated loss of western white pine from the attacks of the mountain pine beetle (Dendroctonus monticolae Hopk.) amounted to 3 percent of the total volume, or 476,167 M.B.F., which is approximately 1/3 of the amount cut for lumber. The mountain pine beetle has also seriously depleted the lodgepole pine stands of the northwestern states during the past decade. This condition is especially pronounced in Montana and southern Idaho, where some 7,020,710 M.B.F., or 35 percent of the total volume, is estimated to have been killed.

Defoliating insects also destroy large bodies of mature timber. The pandora moth and pine butterfly in ponderosa pine, the hemlock

looper in hemlock and Douglas fir, the spruce budworm in spruce and fir, and other species of foliage-feeding insects have from time to time been responsible for extensive destruction of commercial and scenic timber throughout the Northwest.

In addition to the actual value of timber destroyed by insects, with the associated reduction in manufacturing payrolls, insect-killed trees seriously increase the danger of ever-existing forest fire problems. Lodgepole pine trees killed by insects fall in the course of a few years, and when a large percent of the stands has been killed, an almost impenetrable tangle of inflammable material results. A flash of lightning or a carelessly used match in such areas produces a conflagration nearly impossible to check. Ponderosa pine and white pine snags of insect-killed trees which are scattered throughout forested lands stand for many years, materially increasing the cost, difficulty, and danger of fire suppression. An expensive program of insect control could have been absorbed by the cost of controlling fires that have spread from burning snags within the otherwise safe fire lines. In many sales of publicly owned timber the felling of snags is required, and private operations are adopting this precautionary measure of fire prevention.

Another phase of insect activity which is less appreciated than the actual killing of timber is the effect which such destruction has upon the subsequent forest produced. Epidemics of bark beetles often destroy such a large percent of one tree species that the resulting forest becomes one of an entirely different composition, often

of inferior species, requiring a complete change of management. This is especially true in western white pine types, as trees killed by beetles are nearly always replaced by an inferior species.

Though bark beetles can not be eliminated from an area, nor can the successful institution of artificial control be considered as a panacea for all future insect problems, a definite forest-insect program will reduce their depredations to a point where the loss no longer becomes a serious factor in successful management. A forest-insect program must provide for adequate research, a well-organized system of outbreak detection, and the prompt institution of control whenever necessary.

Adequate research is essential in perfecting the practical application of entomology to silvicultural and economical requirements of forestry programs, and to keep pace with the increasing demands for the protection of forest crops against insect enemies. Improvements must be made in the present methods of bark-beetle control. A better understanding of the behavior of bark-beetle infestations must be available so that artificial control measures may take advantage of all beneficial factors. Methods of combating defoliating insects and those species injurious to forest nurseries, plantations, and forest products must be developed. Furthermore, forest entomology is a science of preventing epidemics as well as controlling them. Silviculture may be employed to develop forest types which are unfavorable to the development of insect epidemics, or at least will offer a greater degree of stand resistance to their attacks.

An organized, permanent system of forest-insect surveys provides the only effective means of recording insect outbreaks while in their incipiency. Such data will permit the institution of control at a time when destructive epidemics can be prevented, as well as provide information essential for efficient administration of control projects.

Prompt and adequate instituting of insect control is vital to the successful reduction of timber losses as a result of bark-beetle depredations. The success of control work is seriously impaired by a delay in its institution, as well as the inability to cover the entire infestation unit, which must be of sufficient acreage to eliminate the possibility of the results being influenced by an influx of beetles from untreated areas adjacent.

The need for the inclusion of entomology in the intensive practice of forestry should be self-evident. With adequate timbered acreage being the most important consideration in securing permanency for wood-using industries, it is obvious that unless insect losses are reduced to a minimum the area of sustained yield units will need be increased proportionately to compensate for this loss. There is no intention of implying that forest insects are a barrier to successful timber management, though in some forest types they present problems which must be solved if a near maximum production of timber is to follow. An attempt has been made with this brief article to depict the relationship of insects to forestry. This

conservative depiction emphasizes the need for including in all plans of forest management programs predicated upon a basis of permanency, all factors which have a direct bearing upon the success of the program.